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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/588,708

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EXAMINER

GARDNER, SHANNON M

ART UNIT

PAPER NUMBER

1795

NOTIFICATION DATE

DELIVERY MODE

06/22/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/588,708	Applicant(s) SASAKI ET AL.	
	Examiner Shannon Gardner	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 March 2009 (Applicant's Amendment).
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5-12 is/are pending in the application.
- 4a) Of the above claim(s) 12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Newly submitted claim 12 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: the originally examined claims are drawn to a product (a substrate for thin film solar cells). Claim 12 is drawn to a method, a different class of invention than originally examined.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 12 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Response to Amendment

Applicant's amendment of 3/10/2009 does not render the application allowable.

Remarks

Applicant has amended claim 1, cancelled claim 4, and added new claims 8-12. Claim 12 is drawn to a different class of invention and is withdrawn based on Applicant's election by original presentation. Claims 1-3 and 5-11 are pending in the application and are considered on their merits below.

Status of Objections and Rejections

All rejections from the previous office action are withdrawn in view of Applicant's amendments. New grounds of rejection necessitated by the amendments are set forth below.

Art Unit: 1795

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-3, 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tawada (JP 2003243676, cited in IDS) in view of Matsui (*Influence of substrate*

Art Unit: 1795

texture on microstructure and photovoltaic performance of thin film polycrystalline silicon solar cells, cited in IDS).

As to claim 1, Tawada is directed to a substrate for thin film solar cells (abstract) consisting of a transparent insulating substrate (1), and a transparent electrode layer (11) including at least zinc oxide (paragraph [0011]) deposited on the transparent insulating substrate, wherein:

- The transparent insulating substrate (1) has a fine surface unevenness (10) by a side of the transparent electrode layer (see Figure for configuration).
- The transparent insulating substrate (1) consists of stacked layer of a transparent base material having a smooth surface (1), and a transparent foundation layer (10), and the transparent foundation layer comprises transparent micro-particles having an average particle diameter of 10-100nm and a transparent binder (see abstract and Figure). Tawada teaches an average particle diameter of 0.1 to 1.0 μm , which touches/overlaps with the instant range (see MPEP 2131.03).

Tawada teaches the mean diameter of the insulating particles (10) being 0.1-1.0 μm but is silent as to the surface unevenness having a root-mean-squared (RMS) deviation of the surface of 5 to 50nm.

However, it is known in the thin film crystalline solar cell art to utilize a textured substrate with a RMS roughness of 38nm to improve the conversion efficiency, as taught by Matsui (abstract).

Art Unit: 1795

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to alter the surface unevenness of the device taught by Tawada to have a RMS roughness of 5 to 50nm to improve the conversion efficiency of the device, as taught by Matsui.

Regarding claim 2, modified Tawada teaches the transparent electrode layer having a film thickness of at least 0.8 μm (paragraph [0025]), and also teaches that a thicker layer of ZnO improves the V_{oc} and fill factor (FF) of the device (paragraph [0027]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to increase the thickness of the ZnO layer to be greater than 1 μm to further improve the V_{oc} and FF of the device as taught by Tawada (paragraph [0027]).

Regarding claim 3, it is the Examiner's position that the modified device of Tawada will have a haze ratio measured as a ratio of a diffuse transmittance to a total transmittance using a C light source being not less than 20% as the modified device is substantially similar to the device of the instant claim.

Regarding claim 5, modified Tawada teaches a thin film solar cell comprising the substrate for thin film solar cells according to claim 1 (abstract and Figures).

Regarding claim 7, modified Tawada teaches the transparent electrode layer including at least ZnO being deposited at temperatures of the transparent insulating substrate of not less than 150°C (180°C; Matsui, **Experimental** section).

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tawada (JP 2003243676, cited in IDS) in view of Matsui (*Influence of substrate texture on*

Art Unit: 1795

microstructure and photovoltaic performance of thin film polycrystalline silicon solar cells, cited in IDS) as applied to claim 1 above, and further in view of Oswald (US 20030116185).

Regarding claim 6, Applicant is directed above for a full discussion of Tawada in view of Matsui as applied to claim 1. Modified Tawada teaches an integrated thin film solar cell (Tawada; abstract) comprising the substrate for thin film solar cell according to claim 1 (Tawada; Figure) and at least one crystalline photoelectric conversion unit layer (12) and a back face electrode layer deposited on the transparent electrode layer (paragraph [0012]). Tawada in view of Matsui are silent as to the layers being further isolated by a plurality of isolation grooves so as to form a plurality of photoelectric conversion cells, and the plurality of photoelectric conversion cells being mutually electrically connected in series via a plurality of connection grooves.

However, it is known in the art to introduce isolation grooves/gaps into the back electrode and photoelectric layers of a photoelectric device to separate and electrically isolate adjacent back electrodes as taught by Oswald (Figure 4(g) and paragraph [0039]). Oswald further discloses a later series connection of the separated Photoelectric conversion cells, requiring connection grooves (see paragraphs [0040]-[0052]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to introduce isolation grooves/gaps into the back electrode and photoelectric layers of the modified Tawada device, in order to separate and electrically

Art Unit: 1795

isolate adjacent back electrodes, as well as forming a series connection requiring connection grooves, as taught by Oswald.

7. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tawada (JP 2003243676, cited in IDS) in view of Matsui (*Influence of substrate texture on microstructure and photovoltaic performance of thin film polycrystalline silicon solar cells*, cited in IDS) as applied to claim 1 above, and further in view of Robinson et al. (US 20050238871).

Regarding claims 8-11, Tawada in view of Matsui teach the transparent micro-particles having an average diameter of 0.1 to 1.0 microns.

However, it is known in the art to create a substrate containing silica micro-particles (such as those used in modified Tawada) with particles having an average diameter of 5 to 25 nm, thus creating an improved surface of the substrate for thin film solar cells and other devices, as taught by Robinson (abstract, [0012]-[0018] and [0025]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize silica micro-particles having an average diameter of 5 to 25 nm in the invention to modified Tawada to create an improved surface substrate for the device as taught by Robinson.

Response to Arguments

8. Applicant's arguments filed 3/10/2009 have been fully considered but they are not persuasive:

Applicant argues that "Matsui...applies only to reflective substrates since experimental results based on transparent substrates are not disclosed or suggested" (pp 6-7 of Arguments).

The Examiner respectfully disagrees. Matsui is relied upon to teach that the use of textured substrates with a RMS roughness of a specified value (38 nm) is known in the art to improve the conversion efficiency of a device. It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the RMS roughness to the device of Tawada who teaches a transparent substrate.

Applicant argues that "Matsui's textured substrates are disposed on a backside of the solar cell...they are opposite to the light incident side" (pp 7 of Arguments).

The Examiner notes that the instant claims do not require the placement of the transparent substrate on the front side or the backside of the solar cell. The argument is therefore not commensurate in scope with the claims. Further, the Examiner notes that the modified Tawada reference teaches the structural limitations of the instant claims.

Applicant argues that "Tawada teaches away from the average diameter of less than 100 nm" (pp 8 of Arguments).

The Examiner notes that though Robinson is relied upon to teach average diameters less than 100 nm. The teachings of Tawada provide the structural elements of the device but fail to disclose an average particle size of less than 100nm. However, one of ordinary skill in the art would have looked to the prior art (i.e. Robinson) when determining the particle size in such a device.

Applicant argues that “It was surprisingly found out by the present inventors that formation of a foundation layer having a small particle diameter may enable deposition of a transparent electrode having a larger unevenness...” (pp 8-9 of Arguments).

The Examiner notes that it appears Applicant may intend to claim unexpected results in this section of Arguments. However, there is no evidence provided to support such a claim and thus the argument is not persuasive.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact/Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shannon Gardner whose telephone number is

Art Unit: 1795

(571)270-5270. The examiner can normally be reached on Monday to Thursday, 8am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571.272.1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. G./
Examiner, Art Unit 1795

/Alexa D. Neckel/

Supervisory Patent Examiner, Art Unit 1795